

SPACE HEATERS WITH COMPRESSOR

MAINTENANCE AND SERVICE MANUAL



**THE MAINTENANCE OPERATIONS DESCRIBED IN THIS MANUAL MUST
ONLY BE CARRIED OUT BY QUALIFIED TECHNICIANS RESPECTING ALL
SAFETY RULES**

**USE ONLY ORIGINAL SPARE PARTS
RECOMMENDED BY THE MANUFACTURER**

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1. FUNCTIONING SCHEME OF DIRECT FIRED HEATERS

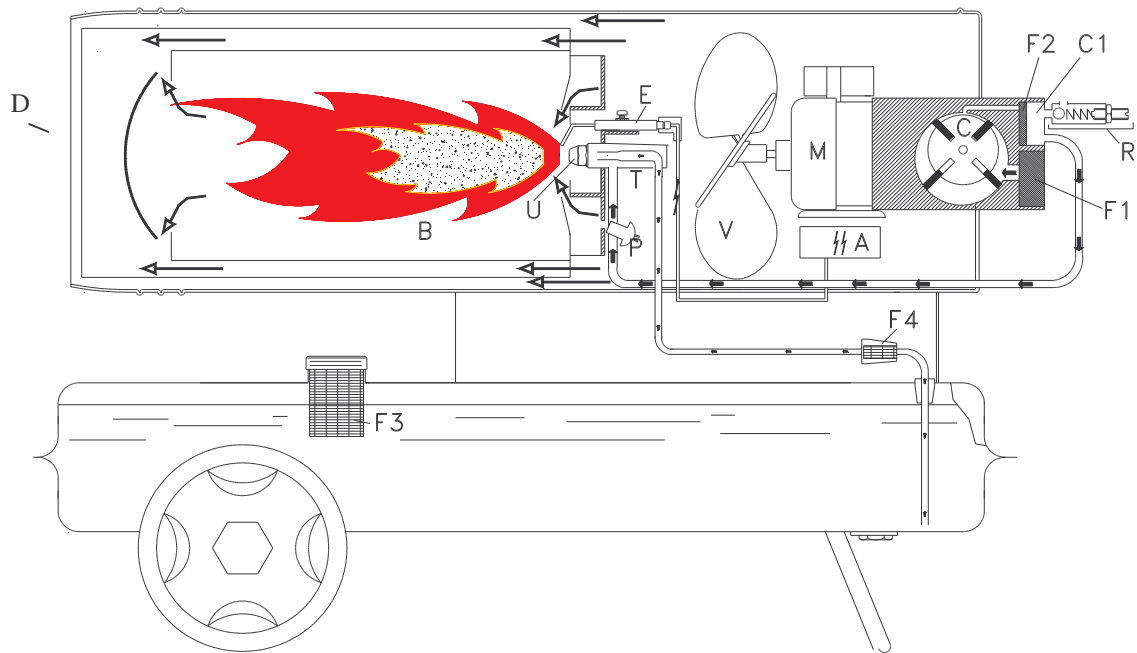


fig.1

M	electric motor	A	ignition transformer
C	centrifugal compressor	V	fan
C1	accumulation chamber	P	photocell
F1	suction filter	T	combustion head
F2	felt delivery filter	E	electrodes
F3	tank filter	U	nozzle
F4	fuel filter	B	combustion chamber
R	air regulation valve	D	flame protecting plate

General functioning system

The rotating compressor, driven the motor, draws compressed air to the nozzle positioned on the combustion head. The air, creating a vacuum effect, sucks the fuel from the tank. The mixture air-fuel enters the combustion chamber and the spark ignites. The fan produces the required airflow.

Detailed functioning system

When the switch is on the "1" position, the motor begins to rotate and activates the compressor and the fan mounted on the shaft. The compressor takes in air from outside, through the filter and then blows it to the storage chamber; the excess air is discharged by the air valve and the remaining air is drawn to the combustion head.

The air going to the nozzle drives through channels of different sizes creating a "Venturi effect", taking in the filtered fuel from the tank. Inside the nozzle, the air and fuel mix and exit atomized. The mixture is ignited by the spark generated by the ignition system.

The photocell has the task to recognize the flame within 10 seconds and transmit a signal to the control unit. If the mixture air-fuel does not ignite, the photocell does not send a signal to the control card, which stop the unit (lock-out). In this case it is important to discover why the ignition does not take place, i.e. no fuel, dirty nozzle, etc. Following this operation, place the switch on the "O" position, wait approximately 10 seconds for the control card to be released and repeat again ignition. The motor fan produces both the airflow necessary for combustion, and the air flow to be warmed flowing through the chamber and casing for cooling surfaces and heating the environment. The front shield, becoming incandescent, acts as a catalyzer for the fuel products and traces of carbon monoxide.

2. FUNCTIONING SCHEME OF INDIRECT AND POST-VENTILATED HEATERS

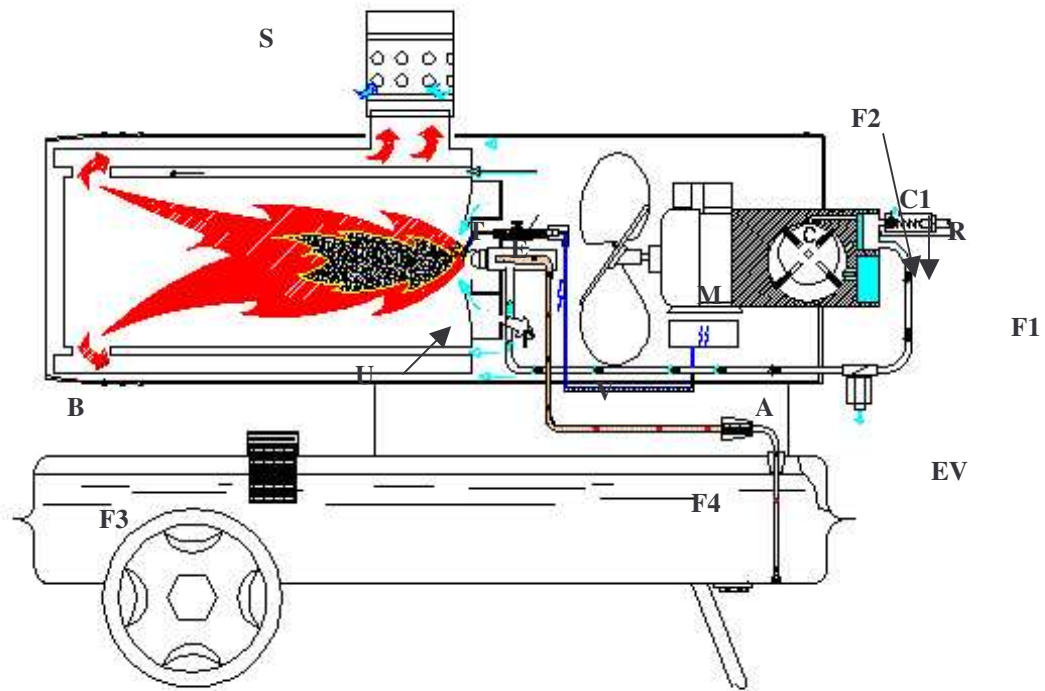


fig.2

M	electrical motor	A	ignition transformer
C	centrifugal compressor	V	fan
C1	accumulation chamber	P	photocell
F1	suction filter	T	combustion head
F2	felt delivery filter	E	electrodes
F3	tank filter	U	nozzle
F4	fuel filter	B	combustion chamber
R	air regulation valve	S	exhaust flue
EV	solenoid valve		

General functioning system

The rotating compressor, driven by the motor, compresses the air and sends it, to the nozzle through a cut-out solenoid valve. The air, creating vacuum, sucks the fuel from the tank. The mixture air-fuel enters the combustion chamber and the spark ignites.

The motor fan generates the air flow necessary for the functioning of the heater which receives heat flowing along the surfaces of the heat exchanger: the warm air is clean, and by the exhaust gas are vented outside through the exhaust flue.

Detailed functioning system

When the switch is on the "1" position the motor begins to rotate and drives the compressor and the fan. The compressor takes in air from outside cleaning it with the filter and compresses it in the storage chamber; the excess air is discharged by the air valve and the remaining air is directed to the combustion head.

The air going to the nozzle passes through channels of different sizes creating a "Venturi effect", taking in the fuel filtered from the tank. Inside the nozzle the air and fuel mix and exit atomized. The mixture is ignited by a spark generated by the ignition system. The photocell has the task to recognize the flame within 10 seconds and send a signal to the control card. If the mixture air-fuel does not ignite, the photocell does not send a signal to the control card which blocks the unit (lock-out). At this point it is important to discover why the ignition does not take place, i.e. no fuel, dirty nozzle, etc. Following this operation, place the switch on the

"O" position, wait approximately 10 seconds for the control unit to be reset and repeat ignition. The motorfan produces the airflow necessary for combustion, and the air flow to be warmed flowing along the chamber and heat exchanger. The front shield, becoming incandescent, acts as a catalyzer for the fuel products and traces of carbon monoxide. The fuel is filtered when filling the tank.

3. INSTALLING THE UNIT

Safety precautions

For safety reasons it is not advisable to leave any type of inflammable substance within the space indicated below:

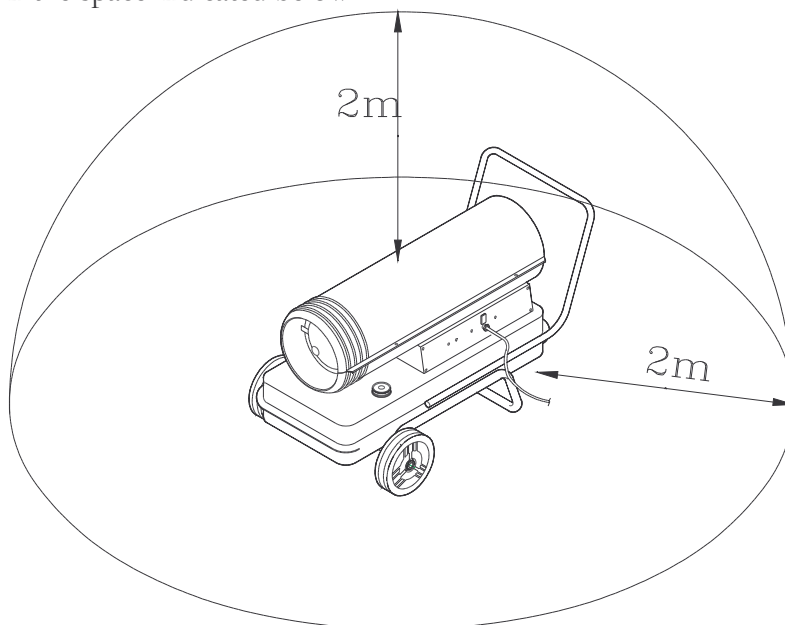


fig.3

side of the unit: 2 mt.
above the unit: 2 mt.

air intake: 2 mt.
hot air outlet: 2 mt.

WARNING! (direct fired heaters)
Do not connect ducts or extensions to the air inlet or outlet

Ventilation requirements

To obtain a good ventilation in any environment it is necessary to have an opening at the same level of the floor for the air to enter and one higher up for it to exit, the free surface of the opening must be:

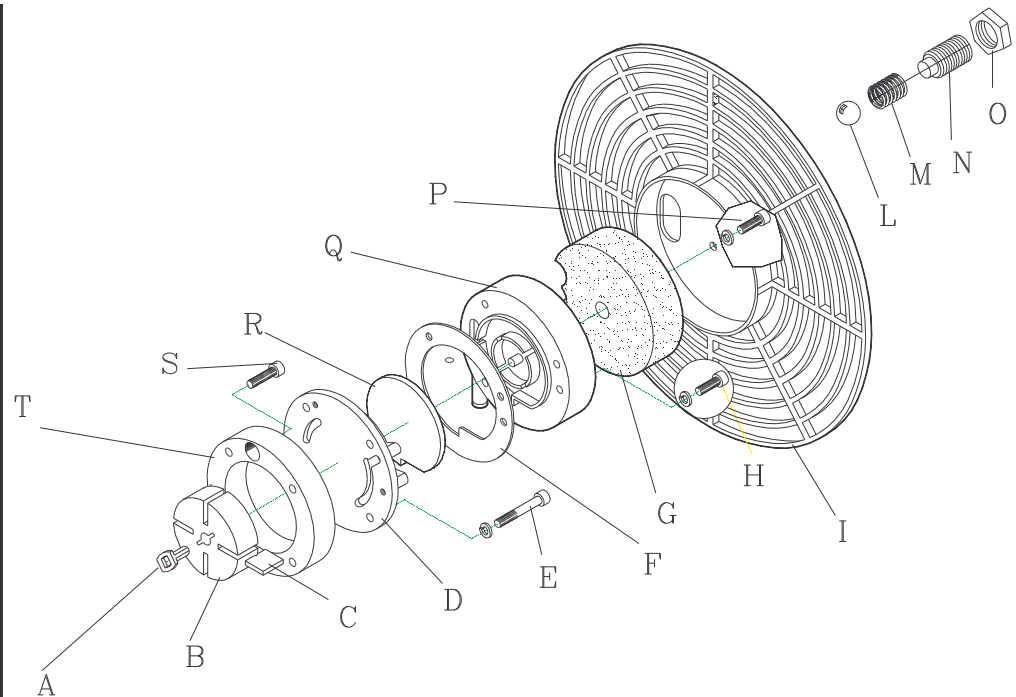
$$0.01\text{m}^2/(\text{KW heating power})$$

The minimum opening for ventilating must be as follows:

15 kW	0.150 m ²
23 kW	0.230 m ²
28 kW	0.280 m ²
43 kW	0.430 m ²
60 kW	0.600 m ²

4. ROTARY COMPRESSOR

Exploded view



- | | |
|-------------------------------------|--------------------------|
| A coupling | L sphere |
| B rotor | M spring |
| C blade | N air regulating screw |
| D compressor cover | O fixing nut |
| E fixing screw for compressor cover | P fixing back grid screw |
| F gasket | Q filter plate |
| G suction filter | R felt outlet filter |
| H fixing filter plate screw | S fixing stator screw |
| I back grid | T stator |

4.1

Assembling sequence

Careful maintenance must be carried out on the compressor. The coupling in plastic enters the graphite rotor with a gentle connection so there is no clearance. Special attention is given when mounting the unit to guarantee a perfect functioning system and avoid abrasion or seizing.

The connection is then inserted on the shaft until the the rotor and the motor plate touch.

At this point the stator ring is mounted and regulates the distance with the rotor (see illustration below). Theoretically the smaller the distance the better the efficiency of the compressor, compatible with the precision when mounting: a good compressor has a distance between 0.2 mm to 0.5 mm.

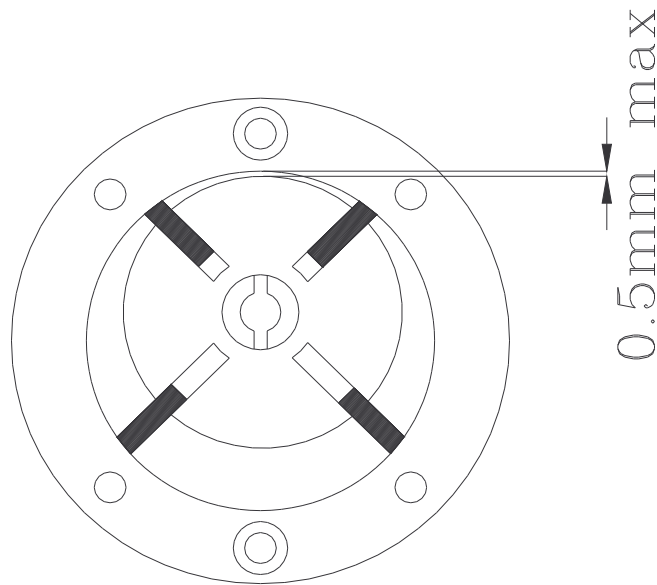
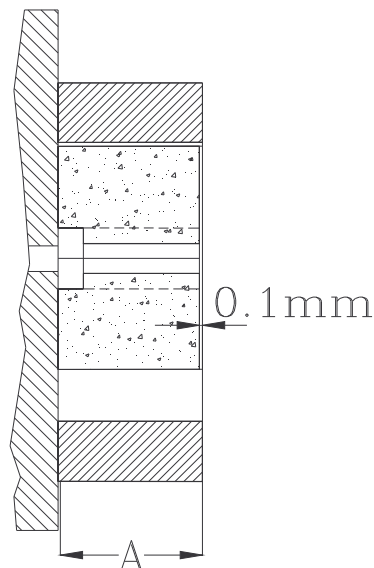


fig.5

At this point of the assemblage it is important to check that the rotor is 0,1 mm back compared to the stator, this is to avoid that the compressor cover blocks the rotor when functioning.

fig.6



If the rotation of the rotor is stiff levigate the surface of the rotor with an abrasive plate n. 600 as shown in the illustration below:

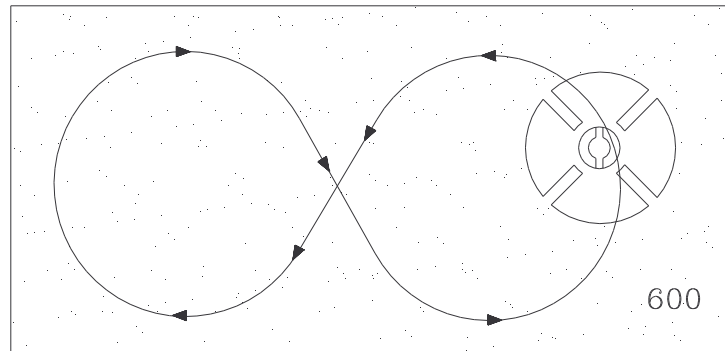


fig.7

According to the capacity of the machine there are two different values that relate to "A":

15-20-28	A = 17mm
25-40-60 kW	A = 21mm

Four blades must be inserted very carefully with the edge pointing towards the center of the rotor and then it must be closed with the compressor cover.

It is necessary to check the machine has been assembled correctly by letting the motor run, power the machine until the flame control card stops, put the switch on the "O" position for about 10 seconds and then reposition the switch on "1", repeat this operation 2 or 3 times.

After this operation, it is possible to replace (if it is dirty) the felt filter; mount the filter plate holder, the suction filter and the air regulator formed by a sphere, a spring and a nut.

4.2 Tuning

The first operation to be followed is the pressure regulation, this can be done by expelling part of the air moved by the compressor. This operation consists of inserting in the hole, at the back of the unit (see illustration), a manometer 0-0.6 bar and tuning the regulation screw until you obtain the pressure indicated on the chart in this manual at chapter 7.

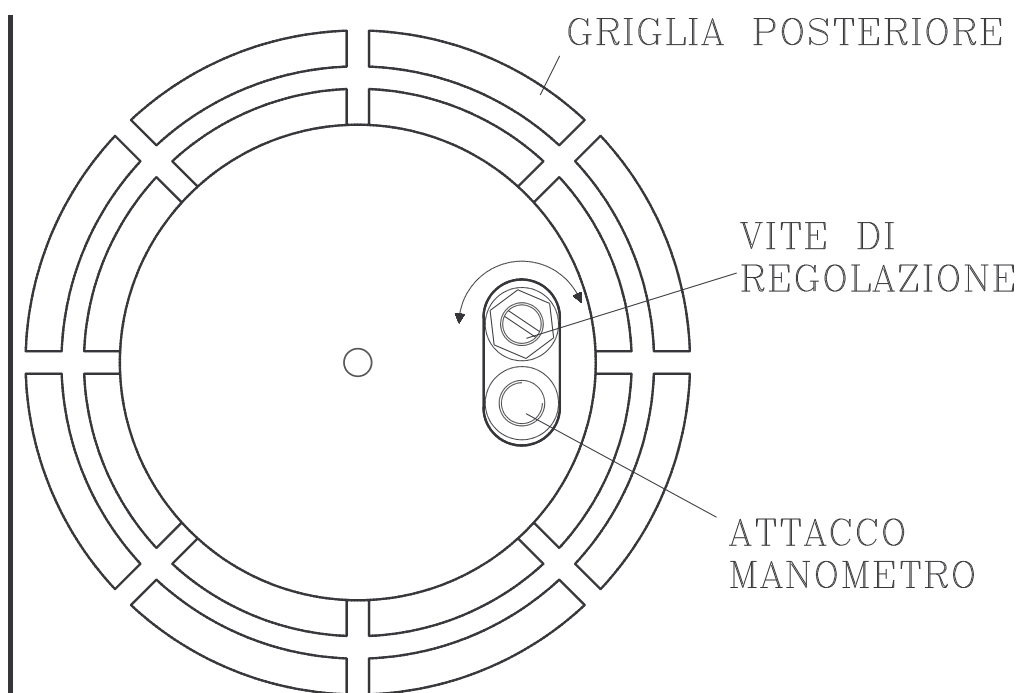


fig.8

CAUTION!

In any case flames must never exit the front flame protection plate because the combustion would be incomplete and would waste fuel and send unburnt gas in the environment

4.3 **Cleaning the air** **filter**

It is very important to regulate all air filters specially if the unit is working in a dusty or humid environment. This allows the machine to work better and the actual air flow becomes equal to the nominal air value.

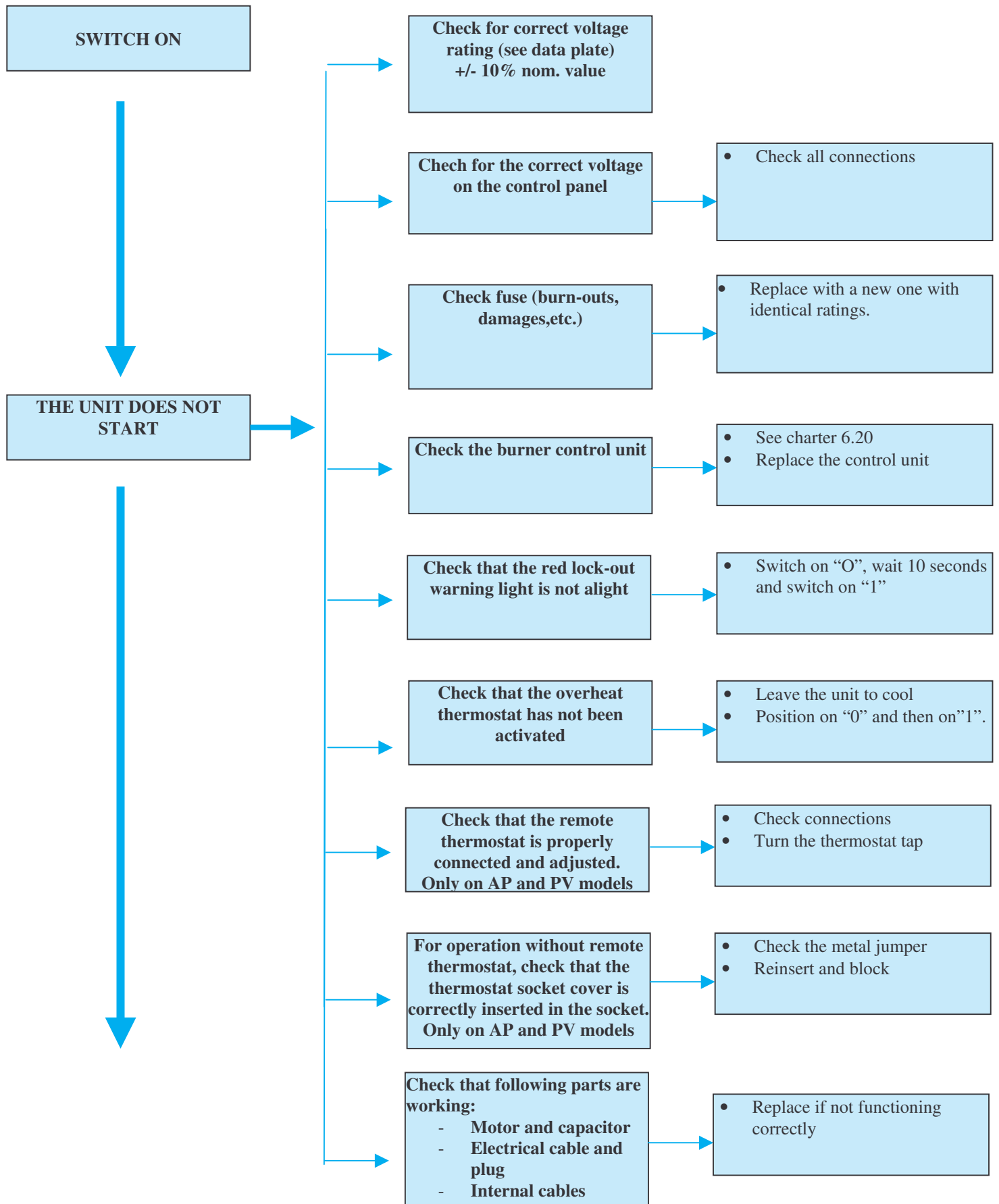
For cleaning air filter check chapter 6.10

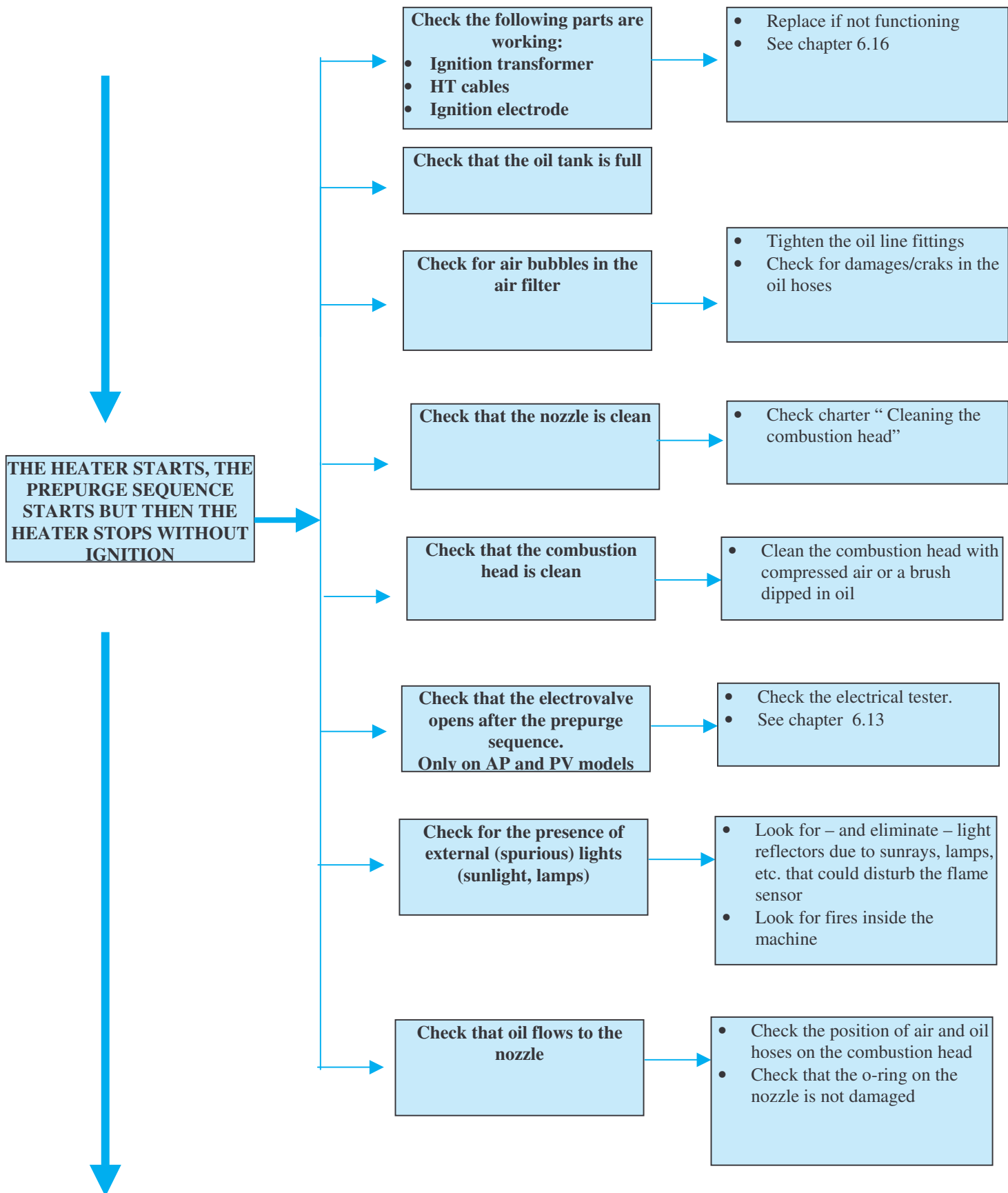
Clean air filters according to the following chart:

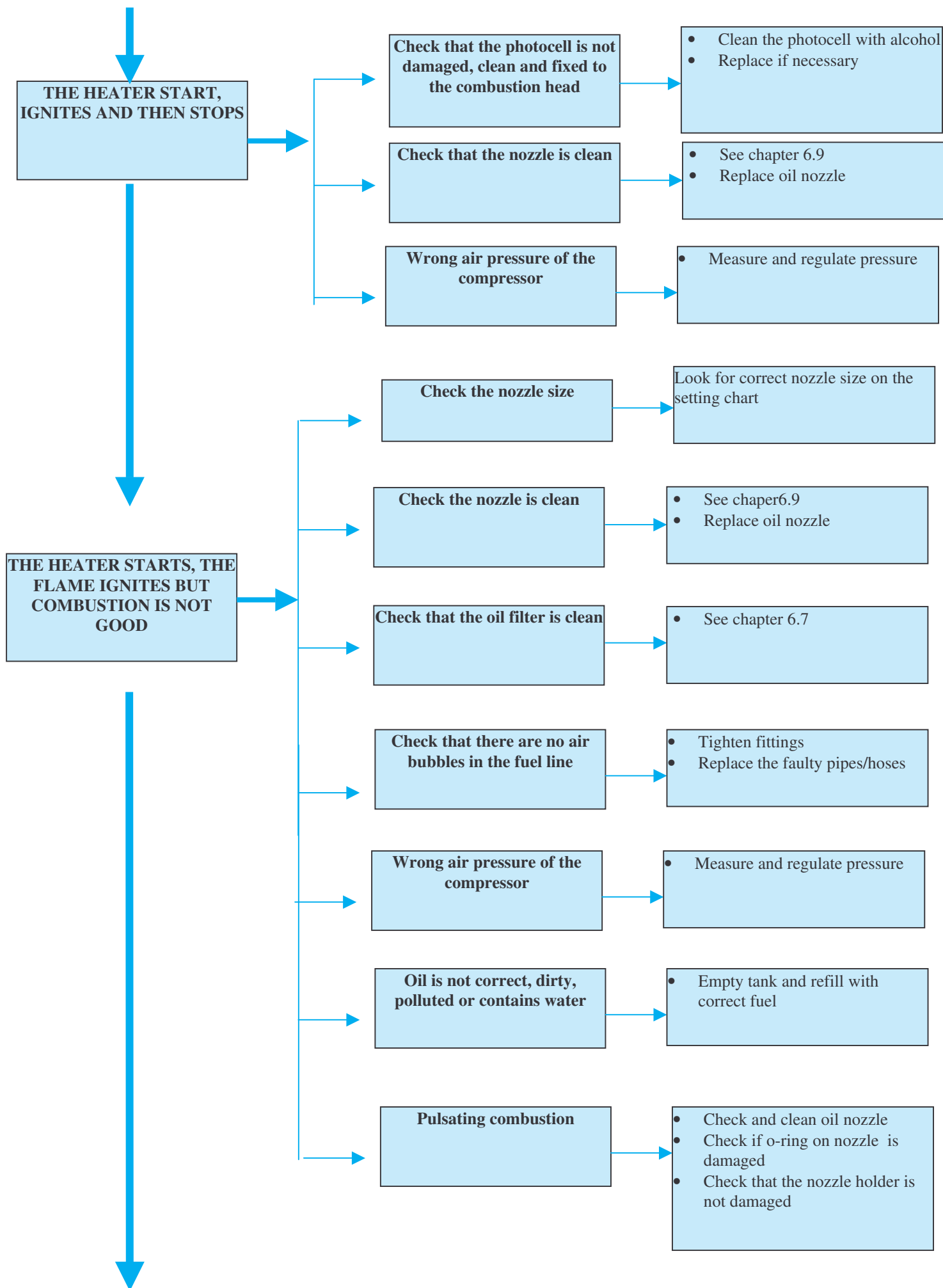
Air Suction filter	every 200 hours
Air outlet filter	every 500 hours
Oil filter	every 1000 hours

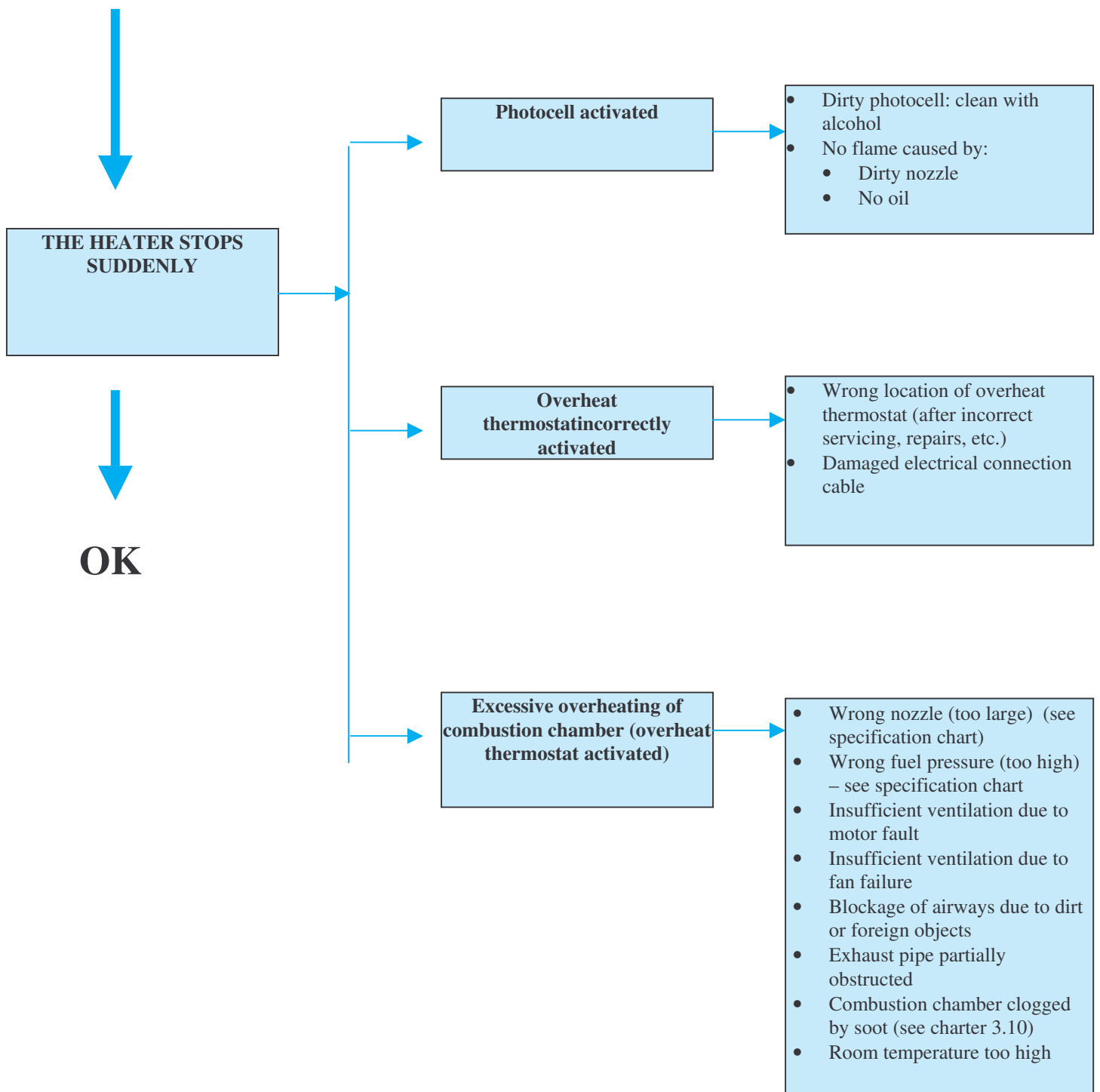
Every 1000 hours replace all filters

5. TROUBLESHOOTING









6. MAINTENANCE AND SERVICE OPERATIONS

THE MAINTENANCE OPERATIONS DESCRIBED IN THIS MANUAL MUST BE CARRIED OUT BY QUALIFIED PERSONNEL ONLY, IN COMPLIANCE WITH THE ELECTRICAL SAFETY STANDARDS IN FORCE.

ONLY USE ORIGINAL OR RECOMMENDED SPARE PARTS.

6.1 CHECKING THE SUPPLY VOLTAGE

The supply voltage must match with the rated voltage indicated on the data plate (230V). The actual input voltage must be within 220V and 240V for good and safe operation.

- Measure the mains voltage, inserting the multimeter tips into the electrical socket and compare it with the rated voltage written on the data plate.

If no voltage is found:

- Check the electrical system fuse(s) and the main distribution board.
- Check the electrical socket.

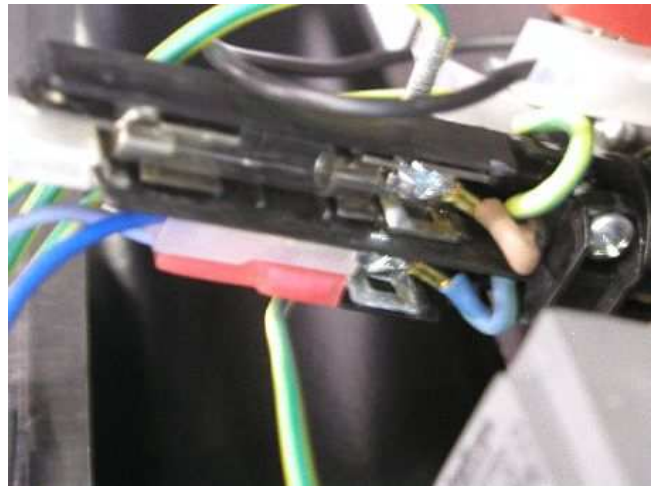
Note : Only carry out maintenance/repairs on the heater and not on the electrical system, for which servicing by authorized personnel is required.

6.2 CHECKING AND REPLACING THE POWER CORD

- Check conditions of cable and plug and identify any fault.
- Unscrew the fixing screw on the control panel and extract the electrical board.
- Unscrew the fixing screw on the plastic protection and remove the protection



Fig. 9



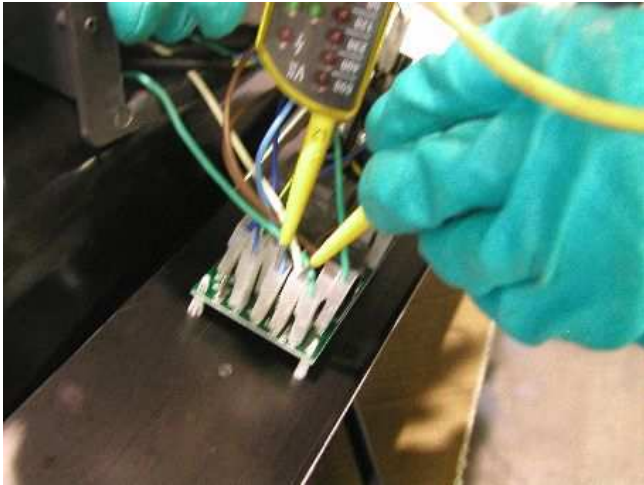
Ill.10

To replace power cord:

- Only use H07RN- power cords with waterproof plug.
- Disconnect live, neutral and earth cables from terminals
- Remove the faulty cable
- Fix the replacement cable to the cable clamp
Inserire il cavo di ricambio nel passacavo (inner length: 5 cm approx.).
- Fix the cable clamp in its seat.
- Connect live and neutral cables.
- Check operation.
- Reassemble control panel.

6.3 CHECKING AND REPLACING THE MOTOR

- Extract the control panel.
- Check supply voltage using a multimeter.



Ill. 11

- Check capacitor for possible faults, cracks, etc.

To replace motor:

- Unplug the heater
- Disconnect motor cables from terminal boards
- Remove upper shell unscrewing 6 M5 screws



Ill. 12

- Remove fan. (see par.6.4)
- Disassemble compressor. (see par.6.11)
- Unscrew motor bracket from lower support.



Ill. 13

- Unscrew motor from motor bracket.



Ill. 14

- Replace motor and fix it to motor bracket. Fix motor bracket to support. Connect motor cables on terminal board following wiring diagram.
- Check operation
- Reassemble all parts.

To replace capacitor:

- Unscrew capacitor cover



Ill. 15

- Extract the capacitor from its casing.
- Disconnect terminals.
- Replace the capacitor with one of the same capacity .
- Connect, check operation and reassemble.

6.4 CHECKING AND REPLACING THE FAN

- Check the fan conditions and look for damages or blocking causes.

To replace a damaged fan:

- Unscrews the fixing screw on the fan hub.
- Remove the faulty fan and replace it with a new one.
- Check that the fan can rotate freely with out interference.
- Reassemble and check operation.

6.5 EXHAUST GAS ANALYSIS (only for indirect heaters)

Perform the exhaust gas analysis using the Shell-Bacharach test to check the quality of combustion.

- Use the special test pump shown on picture 17



Ill. 16

- Insert the special paper in the pump slot.



Ill. 17

- Connect an extension for the exhaust gas analysis to the flue collar on the heater.
- Insert the end of the suction pipe of the pump into the extension.



Ill. 18

- While the heater is on, pull and push the pump piston 10 times in sequence (**IMPORTANT: 10 TIMES EXACTLY**) with slow movements using the complete piston stroke.
- Extract the test paper and check the colour comparing it with the reference scale to find the smoke number.



fig. 19

Diesel heaters are factory set to give a 0 smoke number of the Shell-Bacharach scale. A smoke number = 1 means the combustion is acceptable, while a smoke number = 2 means the combustion is too smoky. In this case find out the causes of the problem and fix it (see flow-chart). A smoky combustion can be due to:

- Clogged combustion chamber due to bad installation (blocked or badly designed exhaust pipe (see operator's manual for guidelines))
- Operation without exhaust extension
- Dirty combustion head, fuel circuit or nozzle (see chapters 6.7, 6.8, 6.9)
- Lack of combustion air due to incorrect installation, too close to a wall or in a small room without free openings.

6.6 CLEANING THE TANK

To clean the tank :

- Lift the heater at about 1 m using proper lifting means.
- Put a container below the tank.
- Unscrew the lower drain cap to empty the tank completely.



fig. 20

To clean the filler filter, remove the tank cap and extract the inner filter. Clean/wash the filter and reinsert it



fig. 21

6.7 CHECKING AND REPLACING THE FUEL FILTER

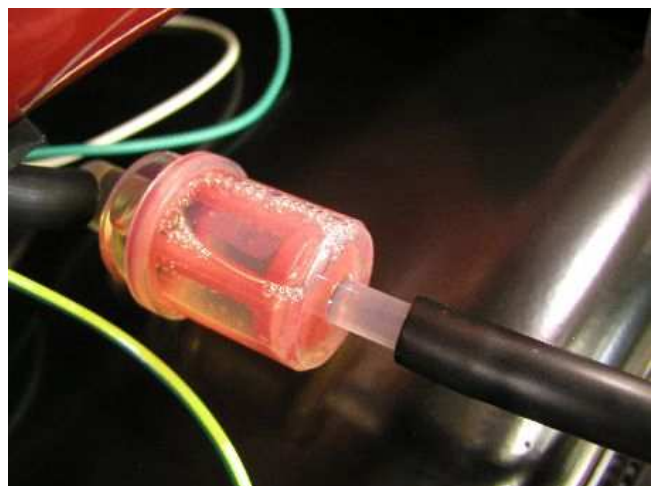


fig. 22

- Unscrew the right side panel.

- Check the filter cartridge is clean, clean or replace it if required.

To replace the complete filter:

- Disconnect the hoses by pulling them out of the filter.
- Reassemble the filter.

6.8 CHECKING AND REPLACING THE FUEL HOSE

Check the the integrity of the fuel hose. There shall be no cracks or damages to prevent improper air suction and bad combustion.

Check the suction fitting is correctly fitted on the hose end and that the suction end is correctly positioned and free, to allow the compressor to draw the correct fuel flow.



fig. 23

6.9 CHECKING REPLACING AND CLEANING THE NOZZLE

- Remove the upper panel.
- Remove the air and fuel hoses from the combustion head.

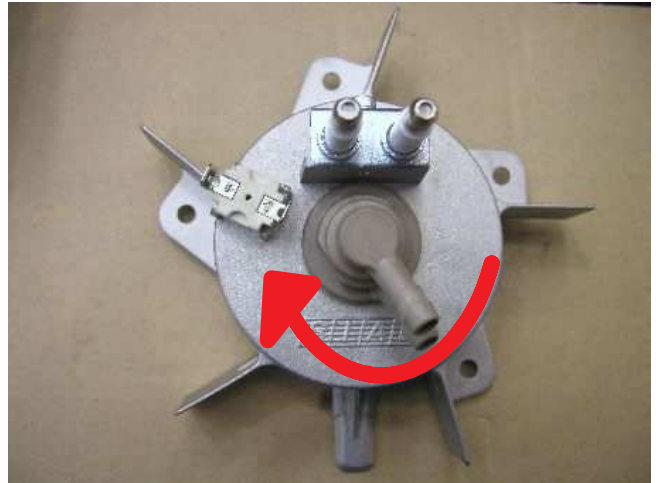


fig. 24

- Extract the burner head by rotating it clockwise to unlock it.
- Unscrew the nozzle
- Clean the nozzle using compressed air

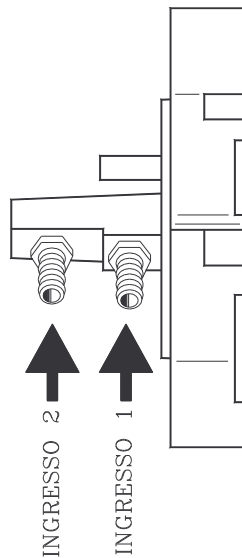


fig. 25

- If require, replace the nozzle. Only use original spare parts (see specification chart).
- Check the integrity of the O-ring on the nozzle stem. It must provide a perfect tightness between the air circuit and the fuel circuit.
- Reassemble the nozzle.
- Reassemble the burher and the panels.

WARNING !

Make sure not to exchange the connections of air and oil hose with each other on the burner head



inlet 1 air
inlet 2 fuel

fig. 26

6.10 CHECKING AND CLEANING THE COMPRESSOR

The basic maintenance operations are:
Cleaning the filters with following frequencies:

- every 200 hours for the inlet filter
- every 500 hours for the outlet filter
- every 1000 replace all filters

More frequent cleaning is required if units are operated in dusty or dirty environments.

Cleaning the suction filter

- Remove the rear plastic guard
- Extract the filter and clean it with compressed air.

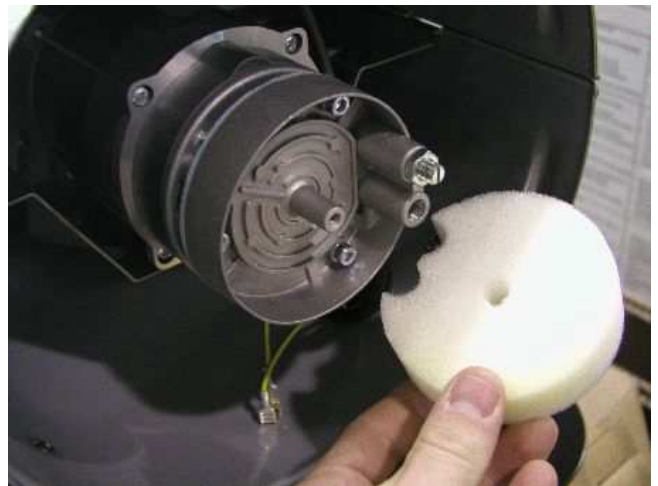


fig.27

Cleaning the outlet filter

- Remove the plastic rear guard
- Remove the 3 screws fixing the filter plate



fig. 28

- Extract the felt filter and blow compressed air on it.

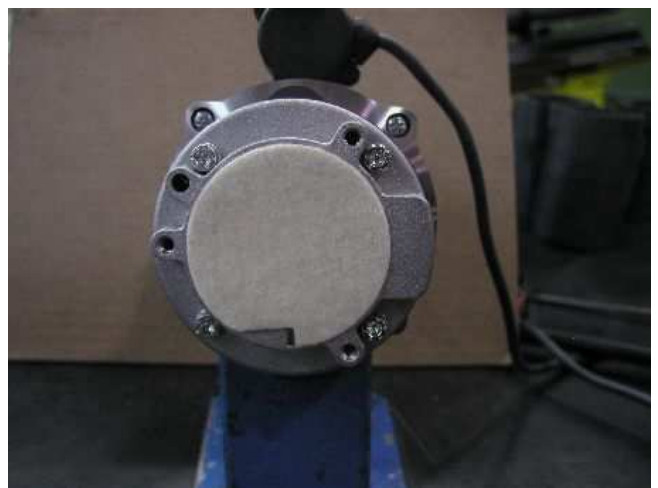


fig. 29

Check the integrity of the sealing gasket located below the filter plate.



fig. 30

6.11 REPLACING AND ADJUSTING THE AIR COMPRESSOR

To disassemble the air compressor proceed as follows.

- Remove the plastic guard.
- Extract the suction filter.
- Remove the filter plate unscrewing the 3 M5 screws.
- Remove the compressor cover unscrewing the 4 M5 screws.
- Remove the stator ring unscrewing the two M4 screws.

To reassemble the air compressor:

- Insert the plastic joint into the central slot of the rotor and fix it to the motor shaft.
- Position the stator ring so that the minimum distance between stator and rotor is 0.2-0.5mm. You can use special spacing plates to do this (or simply a folded sheet of paper) .

WARNING

Do not use abrasive paper on the inner surface of the stator ring as it would damage the surface finish and cause operational problems (production of carbon dust and blocking of outlet filter)



fig. 31

- Fix the stator ring by two M4 screws and washers

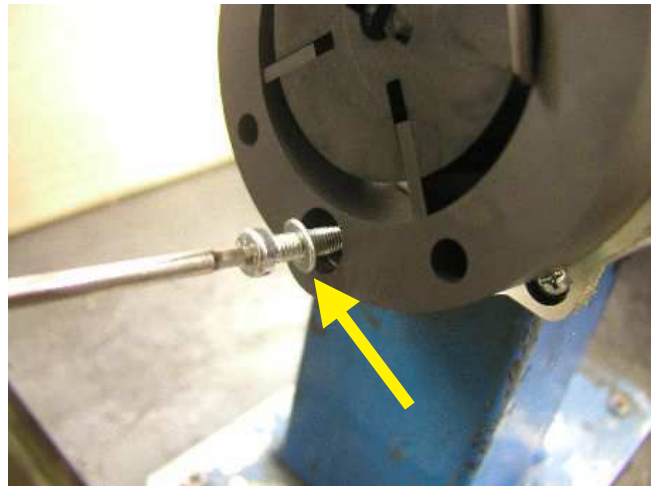


fig. 32

- Insert the four blades correctly into their slots



fig. 33

- Fix the filter plate and fix it by 4 M5 screws.

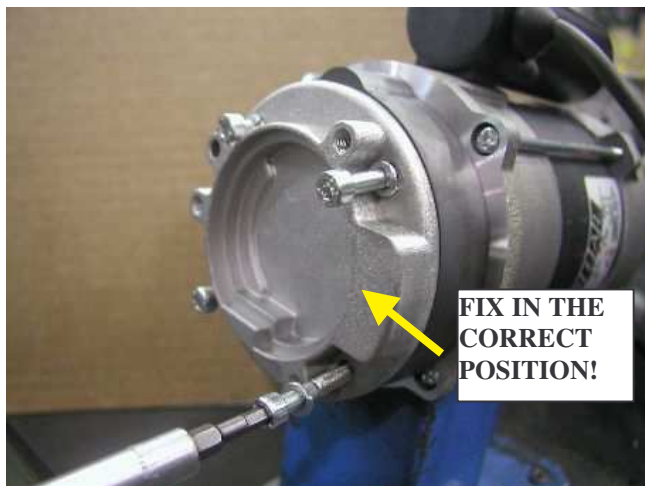


fig. 34

- Insert the outlet filter
- Fix the filter plate by 3 M5 screws
- Insert the suction filter
- Fix the plastic rear guard

Adjusting the air pressure

- Unscrew the threaded cap on the plastic guard.
- Connect a pressure gauge (scale: 0 - 0.6 bar) to the pressure measuring point on the rear guard.

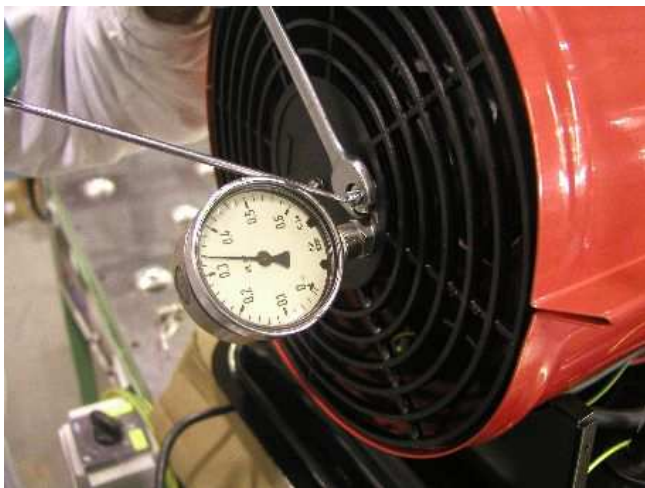


fig. 35

Using a size 13 key and a screwdriver adjust the pressure according to the setting chart included in this manual.

Practical procedure for direct fired heaters

If you have no pressure gauge available proceed as follows.

- Fill the tank completely.
- Switch the unit on and let it warm up

- Increase the air pressure as long as the flames start getting out of the front shield.



fig. 36

- Decrease the pressure 1/4 turn back the adjusting screws as long as the flame do not get out of the front outlet.
- Check there are no flame exiting and the front shield is red or red/orange.
- Otherwise decrease the pressure and re-check.

See also chapter 3.1

6.12 CHECKING THE PRESSURE ADJUSTING VALVE

The adjusting valve consists of:

- Screw
- Nut
- Spring
- Ball



fig. 37

Recommended maintenance:

- Cleaning the ball seat
- Checking the spring elasticity/integrity

6.13 CHECKING AND REPLACING THE AIR SOLENOID VALVE (only for indirect and post-ventilation models)

- Switch the unit on (by main switch or remote thermostat)
- Check that during the pre-ventilation time, when the solenoid valve is closed, (10 s) the air flows through the vent hole on the solenoid valve body.



fig. 38

- Check that during the ignition time the solenoid is powered
- Check that at ignition the solenoid is powered at the correct voltage.

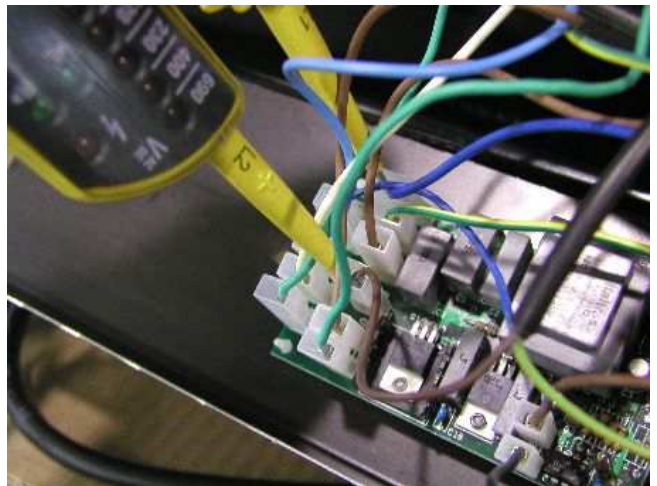


fig. 39

To replace:

- Disassemble the valve connector from the solenoid valve
- Disassemble the two fittings from the faulty valve and fix them to the new one.
- Reconnect the hoses

WARNING

The air shall enter the valve on side marked "1" and follow the arrow direction

- Reconnect the electrical connector

6.14 CHECKING, CLEANING, CONTROLLING, ADJUSTING, REPLACING AND IGNITION ELECTRODES

- Extract the burner head



fig. 40

- Check that the electrodes are clean

- If required, clean them using a brush or similar and the blowing compressed air.
- Check the the distance between electrode and the distance between electrodes and nozzle.
- Adjust the distances according to the diagram below

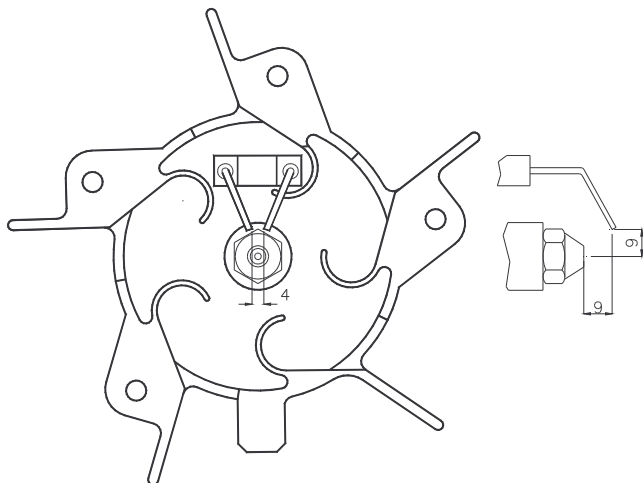


fig. 41

To check that the electrodes spark regularly:

- Fix the burner head in its normal position
- Disconnect and remove the fan from the motor shaft
- Switch the unit on and start the ignition sequence
- Visually check that there are sparks between the electrodes.

WARNING!

ELECTRICAL SHOCK DANGER

The ignition voltage between electrodes is 14 kV. Follow electrical safety regulations during servicing and maintenance operations

- Unplug the unit
- Fix the fan properly and reassemble

To replace the electrodes:

- Disconnect thge high voltage cables
- Unscrews the electrode fiwing screw .

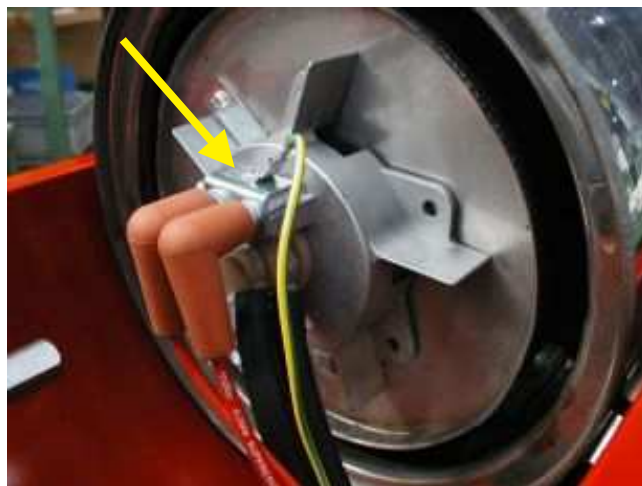


fig. 42

- Replace the electrodes and reconnect the cables
- Receconnect the earthing cable to the burner head.
- Fix the burner head.

6.15 CHECKING AND REPLACING HIGH VOLTAGE IGNITON CABLES

- Checkk the cable connections.
- Check the conditions of cables.
- Disconnect the high voltage cables form electrodes and igntion transformer located on the electrical board.
- Coennct the new cable and check operation.

WARNING

Do not touch the igniton cable near their connectors when the ignition system is powered as you could be injured by electrical discharges.

6.16 CHECKING AND REPLACING THE IGNITION TRANSFORMER

- Disconnect the high voltage cables.
- Disconnect the transformer supply cable from the flame control unit.



fig. 43

- Replace the transformer, and reconnect all cables.

6.17 REPLACING THE FUSE

- Open the electrical board.
- Extract the fuse from the fuseholder

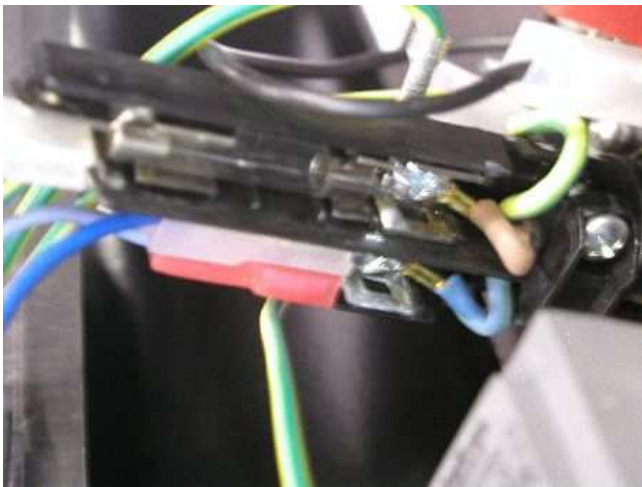


fig. 44

- Check the fuse.
- If the fuse is burnt replace it with one of the same amp rating.

6.18 CHECKING, CLEANING AND REPLACING THE FLAME SENSOR

- Extract the flame sensor from its seat, rotate $\frac{1}{4}$ turn to unlock the plastic casing.



fig. 45

- Extract the flame sensor from its casing pushing gently the two cables. Clean the glass surface using a cloth and ethylic alcohol to remove soot or dirt deposits.



fig. 46

You can check the flame sensor using a multimeter. Connect the tester terminals to the flame sensor cables and proceed as follows:

- Set the multimeter for ohmic measurements
- Expose the flame sensor to a bright light.
- You should read a decrease in the resistance reading as long as the light increases.

To replace the flame sensor:

- Disconnect the flame sensor cables from the flame control unit.
- Replace the faulty sensor.
- Re-connect following the wiring diagram, reassemble and check operation.

6.19 CHECKING AND REPLACING THE SAFETY THERMOSTAT

- Remove the heater cover.
- Check the thermostat is fixed properly

To replace the thermostat:

- Disconnect the thermostat cables.
- Replace the thermostat.
- Reconnect and reassemble.

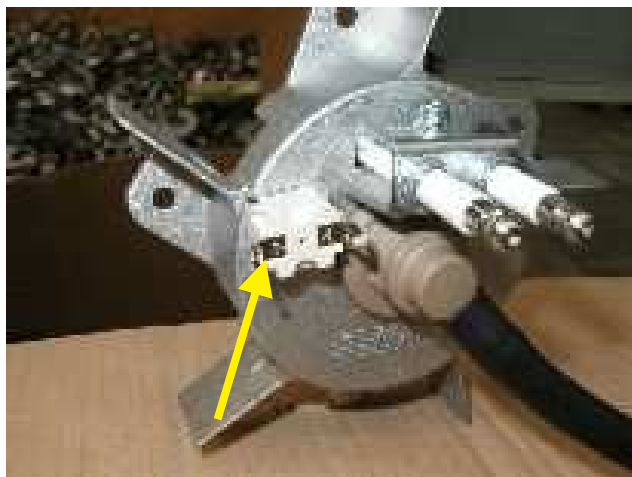


fig. 47

Operation of safety thermostat

The safety thermostat functions when, for some reason, the heater overheats. If this occurs, you have to find out what has caused the overheating and fix the problem.

A unit overheats when:

1. an amount of heat higher than the one required to warm the rated airflow is produced viene sviluppata una quantità di calore superiore a quella richiesta per riscaldare la portata di aria nominale
 2. the actual airflow is lower than the rated airflow.
- The case 1. can occur if the air pressure is too high, (in this case you could also see the flames coming out of the front outlet

The case 2. can occur anytime the ventilation is insufficient, due to an improper use of the heater (ex. inlet or outlet partially or completely blocked) or on rare cases, due to a faulty component (ex. low motor rpm, damaged or locked fan).

See the specific chapters of the manual for the solution of these problems.

If the safety thermostat trips under normal operational conditions then it could be faulty and should be replaced. A simple practical way to check this is to test the electrical continuity between the

thermostat terminals at normal room temperature. Make sure there was no overheating before replacing the thermostat.

6.20 CHECKING AND REPLACING THE FLAME CONTROL UNIT

To check the correct operation of the flame control unit, you can carry out the following tests:

Continuity test

Unplug the heater, then:

- Turn on/off switch to I
- Set the room thermostat on high temperature (contact closed)
- Check electrica continuity between the terminals marked by yellow arrows (with connected wires)

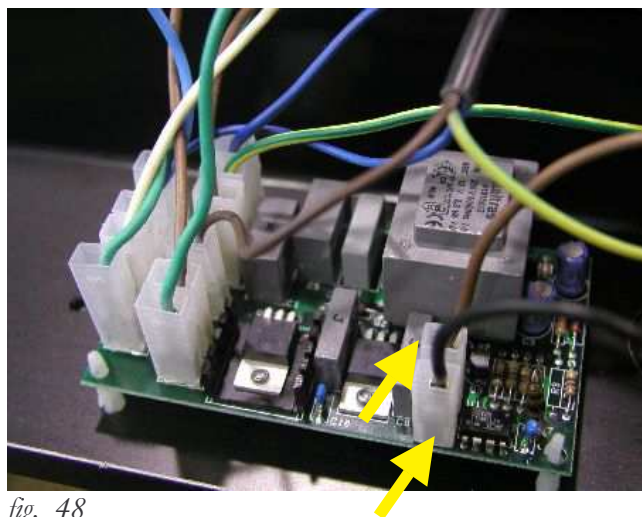


fig. 48

Power supply to load

Plug the heater

- Turn on/off switch to I
- Set the room thermostat on high temperature (contact closed)
- Check supply voltage to the flame control unit



fig. 49

- Check voltage between terminals of transformer, motor, solenoid valve (if applicable).

The supply voltage to loads shall be the same as the mains voltage. If not, replace the flame control unit.

Lock-out test

- Turn the heater on and wait for the end of the ignition cycle.
- Disconnect the wires marked with a yellow arrow (sensor cable, see fig. 50).

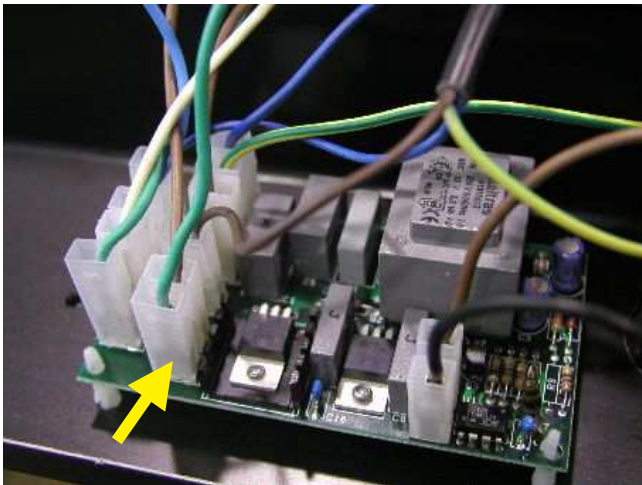


fig. 50

- The heater shall immediately lock-out.

Different types of flame control units

- Detail of flame control unit for direct fired heaters:



fig. 51

Detail of flame control unit for indirect fired heaters



fig. 52

6.21 BURNER HEAD (OLD TYPE)

This chapter is intended to help technicians who have to service repair a heater with the previously used type of burner head. In the old design the fuel nozzle had not an O-ring gasket directly fitted on the stem but a rubber gasket was interposed between nozzle and nozzle holder, to provide tightness between the air and fuel lines.



fig. 53

On the nozzle stem the following part were fitted

- #2 spacing washer
- #1 spring
- #1 side washer
- #1 rubber seal

If there are combustion problems (the heater “puffs” or the fuel cannot be drawn to the nozzle), check the integrity of the rubber seal, that could be impaired due to the thermal stress or to rubber aging.

In this case the solution is to replace the rubber gasket and to oil it before inserting the nozzle.

7. SETTING CHARTS

Indirect fired heaters

	BURNER HEAD	AIR LOCK	FAN	COMPRESSOR SIZE	AIR PRESSURE	FUEL NOZZLE	SAFETY THERMOSTAT	FUSE
15 AP	Air openings: all closed	none	5 blades Ø = 210mm 34°	Thickness 17mm	0.30÷ 0.32 bar	DELAVAN 0.40 GPH code 30609-4	265°C	3.15 A
25 AP	Air openings: all open	n.1 “L” bracket	5 blades Ø = 254mm 34°	Thickness 21mm	0.32 ÷ 0.34 bar	DELAVAN 0.75 GPH code 30609-8	265°C	5 A
40 AP	Air openings: all closed	n.1 straight bracket	5 blades Ø = 254mm 38°	Thickness 21mm	0.32÷ 0.33 bar	DELAVAN 1.00 GPH code 30609-11	265°C	5 A

Direct fired heaters

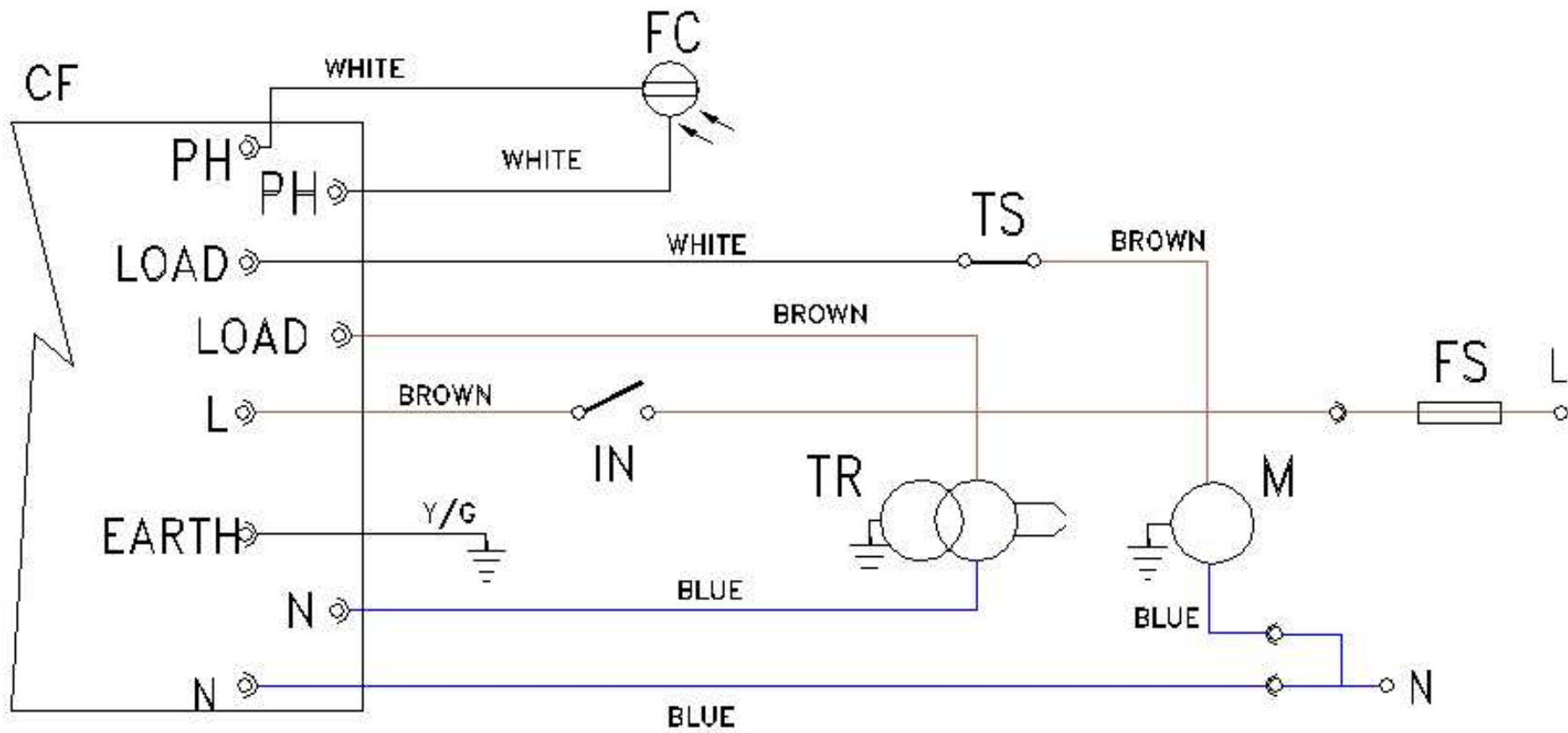
	BURNER HEAD	AIR LOCK	FAN	COMPRESSOR SIZE	AIR PRESSURE	FUEL NOZZLE	SAFETY THERMOSTAT	FUSE
15	Flat head n.2 blades on chamber	None	5 blades Ø = 190mm 15°	Thickness 17mm	0.28 ÷ 0.30 bar	DELAVAN 0.40 GPH cod. 30609-4	//	3.15 A
20	Air openings: all open	None GB version n.1 flat plate	5 blades Ø = 190mm 34°	Thickness 17mm	0.28 ÷ 0.29 bar	DELAVAN 0.65 GPH cod. 30609-7	265°C	3.15 A
28	Air openings: all open	None GB version n.1 flat plate	5 blades Ø = 210mm 34°	Thickness 17mm	0.30 ÷ 0.31 bar	DELAVAN 0.75 GPH cod. 30609-8	265°C	3.15 A
40	Air openings: all open	None GB version n.1 flat plate	5 blades Ø = 254mm 38°	Thickness 21mm	0.31 ÷ 0.32 bar	DELAVAN 1.00 GPH cod. 30609-11	265°C	5 A

Direct fired heaters with post-ventilation

	BURNER HEAD	AIR LOCK	FAN	COMPRESSOR SIZE	AIR PRESSURE	FUEL NOZZLE	SAFETY THERMOSTAT	FUSE
40 PV	Air openings: all open	//	5 blades Ø = 254mm 34°	Thickness 21mm	0.31 ÷ 0.32 bar	DELAVAN 1.00 GPH cod. 30609-11	265°C	5 A
60 PV	Air openings: all open, enlarged	n.1 "L" bracket	4 blades Ø = 250mm 33°	Thickness 21mm	0.34 ÷ 0.35 bar	DELAVAN 1.50 GPH cod. 30609-49	265°C	5 A

8. WIRING DIAGRAMS

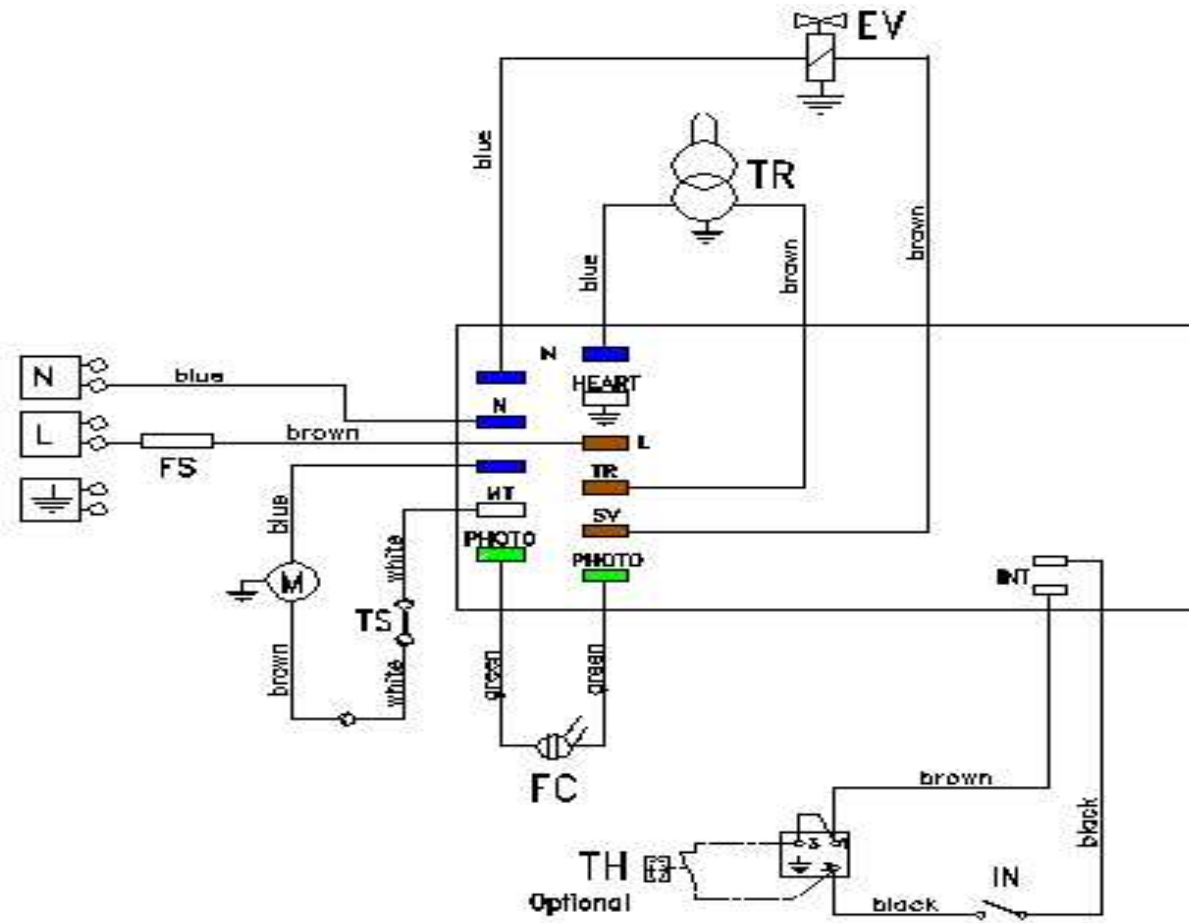
Direct fired heaters



FC flame sensor
FS fuse
IN switch
M motor

TR ignition transformer
TS safety thermostat
CF flame control unit

Indirect fired heaters and direct fired heaters with postventilation



FC flame sensor
FS fuse
IN switch
M motor
EV solenoid valve

TR ignition transformer
TS safety thermostat
CF flame control unit
TH room thermostat